

Prenatal Development Timeline

- | | | | |
|---|--|--|---|
| ■ Nervous | ■ Cardiovascular | ■ Muscular | ■ Early Events |
| ■ Special Senses | ■ Respiratory | ■ Skeletal | ■ Growth Parameters |
| ■ Blood & Immune | ■ Gastrointestinal | ■ Endocrine | ■ General |
| ■ Skin/Integument | ■ Renal/Urinary | ■ Reproductive | ■ Movement |

Unit 1: The First Week

Day 0	<ul style="list-style-type: none"> ■ Embryonic period begins ■ Fertilization resulting in zygote formation
Day 1	<ul style="list-style-type: none"> ■ Embryo is spherically shaped and called a morula comprised of 12 to 16 blastomeres ■ Embryo is spherically shaped with 12 to 16 cells
Day 1 - Day 1	<ul style="list-style-type: none"> ■ Fertilization - development begins with a single-cell embryo!!!
Day 2	<ul style="list-style-type: none"> ■ Early pregnancy factor (EPF) ■ Activation of the genome ■ Blastomeres begin rapidly dividing ■ Zygote divides into two blastomeres (24 - 30 hours from start of fertilization)
Day 3	<ul style="list-style-type: none"> ■ Compaction
Day 4	<ul style="list-style-type: none"> ■ Embryonic disc ■ Free floating blastocyst ■ Hypoblast & epiblast ■ Inner cell mass ■ See where the back and chest will be
Day 5	<ul style="list-style-type: none"> ■ Hatching blastocyst
Day 6	<ul style="list-style-type: none"> ■ Embryo attaches to wall of uterus ■ Solid syncytiotrophoblast & cytotrophoblast
1 week	<ul style="list-style-type: none"> ■ Chorion ■ Chorionic cavity ■ Extra-embryonic mesoderm (or mesoblast) ■ Placenta begins to form

Unit 2: 1 to 2 Weeks

1 week, 1 day	<ul style="list-style-type: none"> ■ Amnioblasts present; amnion and amniotic cavity formation begins ■ Bilaminar embryonic disc ■ Positive pregnancy test
1 week, 2 days	<ul style="list-style-type: none"> ■ Corpus luteum of pregnancy ■ Cells in womb engorged with nutrients ■ Exocoelomic membrane ■ Isolated trophoblastic lacunae □ Embryonic disc 0.1 mm diameter
1 week, 4 days	<ul style="list-style-type: none"> ■ Intercommunicating lacunae network ■ Longitudinal axis ■ Prechordal plate

	<ul style="list-style-type: none"> Trophoblastic vascular circle
1 week, 5 days	<ul style="list-style-type: none"> Implantation complete Yolk sac
	<ul style="list-style-type: none"> Embryonic disc diameter: 0.15 to 0.20 mm
1 week, 6 days	<ul style="list-style-type: none"> Blood islands in umbilical vesicle Angiogenesis in chorionic mesoblast Blood vessels in villi Connecting stalk Primordial blood vessels
	<ul style="list-style-type: none"> Amnion with single cell layer Chorionic villi
2 weeks	<ul style="list-style-type: none"> Embryonic epiblast gives rise to primitive streak and primitive node and Yolk sac Yolk sac

Unit 3: 2 to 3 Weeks

2 weeks, 1 day	<ul style="list-style-type: none"> 3 germ layers Cloacal membrane Primitive groove Rostral-caudal orientation
2 weeks, 2 days	<ul style="list-style-type: none"> Erythroblasts in yolk sac Three types of blood-forming cells in yolk sac Primordial germ cells Allantoic diverticulum Allantoic diverticulum Amnion with two cell layers Notochordal process Secondary villi
2 weeks, 4 days	<ul style="list-style-type: none"> Foregut, midgut, and hindgut Uteroplacental circulation well established Prechordal plate with 1 retinal field Brain is first organ to appear Caudal eminence Neural ectoderm Neural groove and neural folds Neural plate induced by notochordal process Notochordal and neurenteric canals Notochordal plate Connecting stalk Primitive pit (or notochordal pit)
2 weeks, 5 days	<ul style="list-style-type: none"> Prechordal plate with 2 retinal fields
2 weeks, 6 days	<ul style="list-style-type: none"> Numerous blood islands in umbilical vesicle Septum transversum (primitive diaphragm) Foregut Oropharyngeal membrane

	Pharyngeal pouch 1
	Stomodeum forming
	Beginnings of the heart can be seen
	Blood vessels emerge simultaneously in umbilical vesicle, embryo proper, amnion, and connecting stalk
	Common umbilical artery
	Dorsal aortae (paired)
	First pair of aortic arches
	Heart: Cardiogenic plate, cardiac jelly, myocardial mantle, and endocardial plexus
	Left ventricle, right ventricle, conotruncus
	Paired pericardial cavities
	Paired tubular heart
	Forebrain, midbrain, and hindbrain
	Hindbrain with four rhombomeres
	Isthmus rhombencephali demarcates midbrain and hindbrain
	Mesencephalon (or midbrain)
	Neural cord within caudal eminence
	Neural groove deepens substantially
	Primary neuromeres
	Three main divisions of brain
	Cephalic and caudal folds
	Neural crest: Rostral and facial
	Primitive streak reaches neurenteric canal
	Somites with central somitocoels: Pairs 1 through 3
3 weeks	Blood and blood vessels

Unit 4: 3 to 4 Weeks

3 weeks, 1 day	Thyroid primordium emerges from floor of pharynx
	Nephrogenic cord emerges (at 10 somites)
	Cloaca
	Common coelomic cavity divides into peritoneal, pericardial, and pleural cavities
	Liver: Hepatic plate (endoderm)
	Midgut emerging
	Pharyngeal arches 1 and 2
	Pharyngeal cleft 1
	Second pharyngeal cleft and pouch
	Pharyngeal groove and ridge with laryngotracheal sulcus
	Respiratory outgrowth
	Atria (right and left) far apart
	Bulbis cordis
	Circulatory system function begins
	Endocardial tubes fuse forming tubular heart
	Heart begins beating

	Pericardial sac
	Pericardium
	Primary head vein
	Sinus venosus
	Tubular heart begins folding
	Umbilical arteries
	Umbilical veins (right and left)
	Optic primordia fill neuromere D2
	Otic pits
	Chiasmatic plate
	Mesencephalic flexure
	Neural tube
	Neuromeres D1 and D2 (in diencephalon)
	Optic sulcus in forebrain
	Pontine region identifiable near cranial nerves VII and VIII
	Segment D in rhombencephalon
	Some secondary neuromeres
	Superior colliculus
	Telencephalon
	Telencephalon (or telencephalic) medium
	Body cavities
	Hyoid arch
	Mandibular arch and maxillary process
	Neural crest: Trigeminal, facioacoustic, glossopharyngeal-vagal, and occipitospinal
	Somites: Pairs 4 through 12
3 weeks, 3 days	Primordial germ cells begin moving from umbilical vesicle to hindgut
	Thyroid complete
	Face: Maxillary and mandibular processes (bilaterally)
	Cloacal membrane
	Mesonephric duct emerges from nephrogenic cord
	Nephric vesicles
	Cystic primordium
	Hepatic diverticulum
	Liver
	Membrane between future mouth and throat may begin to rupture
	Angiogenesis along surface of central nervous system
	Aortic sac
	Atrioventricular canal
	Capillary plexus begins forming around brain and spinal cord
	Conotruncus
	Conus cordis emerging from right ventricle

	Endocardium
	Heart contractions produce peristaltic blood flow
	Internal carotid arteries
	Interventricular septum
	Primordium of myocardium
	Sinus venosus separating from left atria
	Trabeculated outpouches along primary cardiac tube representing primordia of left and right ventricles
	Trigeminal and otic arteries
	Facio-vestibulocochlear ganglia (CN VII, CN VIII)
	Glossopharyngeal and vagal ganglia
	Optic evagination (starting at 14 somites)
	Otic vesicle
	Trigeminal ganglia (CN V)
	Neural crest: Optic crest emerges during Carnegie Stages 11 and 12
	Nose: Nasal plate
	Optic vesicles form (17 to 19 somites)
	Adenohypophysial pouch
	Adenohypophysis
	Lamina terminalis
	Mesencephalon contains tectum and tegmentum
	Neural crest production and migration continue
	Neurohypophysial primordia
	Neuropore (near brain) closes
	Notochord
	Segmentation of mesoblast alongside neural tube bilaterally
	Somites: Pairs 13 through 20
3 weeks, 3 days - 5 weeks, 6 days	All eight rhombomeres (Rh 1 through Rh 7, Rh D) - Present in stages 11 through 17
3 weeks, 5 days	Telopharyngeal bodies
	Alimentary epithelium invades stroma of liver
	Alimentary epithelium proliferates in primordia of stomach, liver, and dorsal pancreas
	First part of pancreas
	Gastric portion of foregut elongates (25 to 28 somites)
	Hepatic primordium with abundant vascular plexus
	Omental bursa
	Oropharyngeal membrane is ruptured
	Pharyngeal arch 3
	Pharyngeal arches with dorsal and ventral parts
	Umbilical vesicle elongates
	Cervical sinus
	Laryngotracheal groove
	Lung bud

	Tracheo-esophageal septum
	Atrioventricular canal
	Common cardinal veins (right and left)
	Descending aorta
	Heart circulates blood to and from central nervous system, umbilical vesicle, and chorion
	Hepatocardiac channels (right and left)
	Rostral and caudal cardinal veins along brain and spinal cord feeding common cardinal veins
	Septum primum and foramen primum sometimes present
	Septum primum, foramen primum
	Sinu-atrial foramen prevents backflow into sinus venosus
	Sinus venosus collects venous blood from entire embryo
	Superior vena cava, inferior vena cava, and sinus venosus collecting all venous blood
	Unidirectional circulation
	Vitelline arteries and veins
	Hypoglossal cord (CN XII) enters pharyngeal arch 4
	Otocyst nearly closed
	Nasal discs form part of ectodermal ring
	Optic vesicles covered by sheath (formed by mesencephalic and optic crest)
	Brain involves 40% of neural tube
	Brain: Embryonic commissural plate
	Ectodermal ring complete
	Hypoglossal nucleus (CN XII)
	Lowermost spinal cord formation begins
	Mamillary recess
	Marginal layer in rhombencephalon
	Mesencephalic flexure at 90 degrees
	Mesencephalon with two neuromeres: M1 and M2
	Motor neurons in basal plate of rhombencephalon
	Neural tube closes (lower back)
	Neurofibrils form in rhombencephalon
	Primary neurulation ends
	Primordia of ventral thalamus and subthalamus in diencephalon
	Sulcus limitans
	Sulcus limitans in midbrain
	Somites: Pairs 21 through 29
	Upper limb primordium at level of somites 8 to 10
	Progressively C-shaped embryo
4 weeks	Spleen primordia
	Thymic primordia

	Lower lip forms from merging of mandibular processes
	Melanoblasts in epidermis
	Skin is so thin, you can see through it!
	Gonadal ridge extends from C-7 to T-8 levels
	Primordial germ cells migrate to mesonephric ridges
	Primordial germ cells number several hundred
	Urorectal septum
	Thyroid bilobed and attached to pharynx by thyroglossal duct
	Diaphragm primordia
	Glomeruli emerge in mesonephros
	Mesonephric duct attached to cloaca
	Nephric tubules now S-shaped
	Urogenital sinus
	Urorectal cleavage line
	Diverticulum ilei marks division between foregut and hindgut
	Esophagus primordia
	Intestines growing in length
	Mesentery from end of duodenum to proximal half of colon
	Opening between gut and umbilical vesicle decreases
	Pancreas: Ventral pancreas
	Pharyngeal pouches 1 through 4
	Pharynx
	Pleuroperitoneal canals
	Small & large intestines
	Stalk of umbilical vesicle lengthens and narrows
	Stomach assumes shape of a spindle
	Umbilical vesicle at height of development
	Vitelline duct
	Bronchial buds
	Lungs begin filling chest cavity
	Mesenchyme from coelomic epithelium surrounds esophagus and lung buds
	Trachea
	Anterior, middle, and posterior cerebral plexuses
	Aorta branches include dorsal intersegmental, lateral segmental, and ventral segmental arteries
	Aortic arches 4 and 6
	Artery from the common iliac artery feeds each lower limb bud
	Atrioventricular bundle
	Cardiac contractions still under myogenic control
	Celiac artery, superior and inferior mesenteric arteries
	Circulatory system "well established"

	<ul style="list-style-type: none"> Common iliac arteries (right and left, from dorsal aorta bifurcation)
	<ul style="list-style-type: none"> Contractions well coordinated and sequential from sinus venosus to atria to ventricles
	<ul style="list-style-type: none"> Functioning two-chamber heart
	<ul style="list-style-type: none"> Gas exchange through placenta begins
	<ul style="list-style-type: none"> Gelatinous reticulum (or cardiac mesenchyme)
	<ul style="list-style-type: none"> Heart chambers bulging with fluid
	<ul style="list-style-type: none"> Heart now functions as two parallel pumps
	<ul style="list-style-type: none"> Heart rate (about) 113 beats/min
	<ul style="list-style-type: none"> Heart: Atrioventricular cushions (rostroventral and caudodorsal)
	<ul style="list-style-type: none"> Heart: Myocardium wall 3 to 4 cells thick
	<ul style="list-style-type: none"> Primary head veins (right and left) drain anterior, middle, and posterior cerebral plexuses and feed precardinal veins
	<ul style="list-style-type: none"> Small arteries emerging throughout mesoderm
	<ul style="list-style-type: none"> Ventricle walls trabeculated
	<ul style="list-style-type: none"> Vertebral arteries
	<ul style="list-style-type: none"> Vitelline veins empty exclusively into hepatic plexus
	<ul style="list-style-type: none"> Most cranial nerve ganglia
	<ul style="list-style-type: none"> Trigeminal, glossopharyngeal, and vagal preganglia
	<ul style="list-style-type: none"> Basement membrane of otic disc surrounds otic vesicle
	<ul style="list-style-type: none"> Endolymphatic appendage
	<ul style="list-style-type: none"> Otic invagination
	<ul style="list-style-type: none"> Otic vesicle closes
	<ul style="list-style-type: none"> Terminal-vomeronasal neural crest
	<ul style="list-style-type: none"> Brain: Commissural plate
	<ul style="list-style-type: none"> Cerebellum
	<ul style="list-style-type: none"> Common afferent tract
	<ul style="list-style-type: none"> Fourth ventricle
	<ul style="list-style-type: none"> Interstitial nucleus (part of medial longitudinal fasciculus)
	<ul style="list-style-type: none"> Isthmus rhombencephali (a new neuromere)
	<ul style="list-style-type: none"> Oculomotor (CN III) and trochlear nuclei (CN IV) in mesencephalon (midbrain) and isthmus respectively
	<ul style="list-style-type: none"> Retinal and lens discs
	<ul style="list-style-type: none"> Amnion surrounds connecting stalk and vitelline stalk
	<ul style="list-style-type: none"> Amnion surrounds embryo
	<ul style="list-style-type: none"> Cervical flexure
	<ul style="list-style-type: none"> Hyoid arch subdivides into dorsal and ventral segments
	<ul style="list-style-type: none"> Limb buds - the first sign of arms and legs
	<ul style="list-style-type: none"> Lower limb buds
	<ul style="list-style-type: none"> Umbilical cord emerging
	<ul style="list-style-type: none"> Upper and lower limb buds

Unit 5: 4 to 5 Weeks

4 weeks, 3 days	Early eyes
4 weeks, 3 days - 5 weeks	Germ cells migrate to gonads
4 weeks, 4 days	Thymus
	Parathyrogenic zones
	Thyroglossal duct
	Thyroid pedicle lengthens
	Dorsal contour develops depression at level of sclerotomes 4 and 5
	Muscular plates between upper and lower limb buds
	Glomerular capsules, partially vascularized
	Mesonephric corpuscle
	Metanephrogenic cap emerges from ureteric bud
	Ureteric buds
	Angiogenesis within peri-esophageal mesenchyme
	Epiploic foramen
	Lesser sac (omental bursa)
	Small intestine forming coils
	Tongue: Hypopharyngeal eminence
	Arytenoid swellings (right and left)
	Capillary network surrounds pulmonary mesenchyme
	Epithelial lamina of larynx
	Lungs: Right and left primary (or main stem) bronchi
	Mesenchyme covering esophagus and respiratory tree separates
	Mesenchyme surrounds bronchi
	Pleura (mesothelium) surrounds part of mesenchyme
	Right main bronchus longer than left
	Atria walls thin, ventricle walls thick and trabeculated
	Atrioventricular cushions not fused
	Common pulmonary vein drains pulmonary plexuses into left atrium
	Conotruncal ridges or cushions (remnants of cardiac jelly)
	Epicardium
	Left subclavian artery feeds left axillary artery, left vertebral artery, and left thyrocervical trunk
	Outflow tract still with one lumen
	Posterior communicating arteries
	Pulmonary arch (sixth aortic arch) forms from aorta and aortic sac
	Pulmonary capillary network fed by pulmonary arteries, drain into left atrium
	Sino-atrial (SA) node
	Superior mesenteric artery and vein
	Upper limb buds with early marginal blood vessel

	Brachial plexus
	Cervical plexus
	Dorsal roots
	Hypoglossal nerve roots unite (CN XII)
	Lens and retina invaginate to form optic cup
	Primordium of cochlear duct
	Rami communicantes
	Spinal nerves reach muscle primordia
	Upper limb buds innervated
	External ear: Auricular hillocks merging
	Eyes located on sides of head
	Lens pits
	Lens vesicle open to surface (lens pore)
	Nose: Nasal pits
	Nose: Nasal plate (or disc) flat or concave
	Pigment in retina (external layer of optic cup)
	D1 and D2 no longer identifiable within diencephalon
	75% of midbrain covered by marginal layer
	All 16 secondary neuromeres
	Brain enlarges 50% since Carnegie Stage 13
	Brain: Cerebral hemispheres appear and begin rapid growth
	Brain: Lateral ventricles
	Cerebellum with intermediate and ventricular layers
	Cerebellum: Primordium found in alar plate of rhombomere 1
	Corpora striata primordia connected by commissural plate
	Cranial nerve 3
	Di-telencephalic sulcus
	Dorsal and ventral thalami
	Dorsal funiculus
	Hypothalamic sulcus
	Hypothalamus
	Mamillary region
	Medial and lateral longitudinal fasciculi
	Median ventricular eminence
	Pontine flexure
	Preoptic sulcus extends between optic evaginations
	Preoptico-hypothalamo-tegmental tract
	Primary meninx surrounds most of brain
	Rhombic lip
	Spinal cord wall with three zones: ventricular (ependymal) zone, mantle (intermediate) zone, and marginal zone
	Subthalamus with medial striatal ridge emerging

	■ Synencephalon
	■ Tegmentum
	■ Tentorium cerebelli, medial portion
	■ Terminal-vomer nasal crest contacts brain (olfactory area)
	■ Torus hemisphericus (TH)
	■ Velum transversum
	■ Ventral longitudinal fasciculus
	■ Ventral segment of hyoid arch subdivides
4 weeks, 5 days	■ Primordium of antitragus emerges from ventral subsegment of hyoid arch
	■ Gonad framework found in coelomic epithelium
	■ Thyroid detached from epithelium of pharynx in some embryos
	■ Lower limb bud rounded proximally and tapered distally
	■ Mesenchymal skeleton in upper and lower limbs
	■ Right and left neural processes
	■ Sclerotomic material around notochord (rhombomere D level)
	■ Vertebrae well defined
	■ Vertebral centra
	■ Primary urogenital sinus
	■ Ureteric bud extends to pelvis of the ureter
	■ Bladder and rectum are separating caudal to ureters
	■ Caecum
	■ Dense mesenchyme surrounds much of gastrointestinal tract
	■ Esophagus elongates, passes dorsal to carina and between main stem bronchi
	■ Gall bladder and cystic duct
	■ Liver: Hepatic ducts
	■ Ventral pancreas appears as an offshoot of the cystic duct
	■ Lobar bud swellings denote areas of secondary bronchi
	■ Remnants of coelomic epithelium forming visceral pleura
	■ Atrioventricular cushions apposed
	■ Blood flow divided into right and left streams through atrioventricular canal, ventricles, outflow tract, and aortic sac
	■ Blood vessels penetrate diencephalon
	■ Capillary plexus surrounds esophagus
	■ Capillary plexus surrounds lung buds
	■ Cardiac mesenchyme surrounds ventricles and outflow tract
	■ Coronary arteries (terminal end)
	■ Foramen secundum begins in septum primum

	<ul style="list-style-type: none"> Left ventricle with thicker walls and greater volume than right
	<ul style="list-style-type: none"> Right subclavian artery originates from brachiocephalic artery and feeds right thyrocervical trunk and axillary and vertebral arteries
	<ul style="list-style-type: none"> Semilunar cusps
	<ul style="list-style-type: none"> Capsule present around lens
	<ul style="list-style-type: none"> Corneal epithelium overlying optic cup
	<ul style="list-style-type: none"> Ear: Endolymphatic duct
	<ul style="list-style-type: none"> Geniculate and vestibulocochlear ganglia separating
	<ul style="list-style-type: none"> Lens body now present containing some lens fibers
	<ul style="list-style-type: none"> Lower limb buds innervated
	<ul style="list-style-type: none"> Optic stalk
	<ul style="list-style-type: none"> Utricle, endolymphatic duct, and endolymphatic sac
	<ul style="list-style-type: none"> Utriculo-endolymphatic fold
	<ul style="list-style-type: none"> External ear primordia emerges from caudolateral portion of mandibular arch
	<ul style="list-style-type: none"> Face: Lateral and medial nasal processes bilaterally
	<ul style="list-style-type: none"> Lateral nasal processes along dorsolateral lip of nasal pits
	<ul style="list-style-type: none"> Lens vesicles closed, pores absent
	<ul style="list-style-type: none"> Nose: Nasal discs recede forming nasal pits
	<ul style="list-style-type: none"> Optic chiasm
	<ul style="list-style-type: none"> Adult lamina terminalis
	<ul style="list-style-type: none"> Amygdaloid area
	<ul style="list-style-type: none"> Brain with five main sections
	<ul style="list-style-type: none"> Cerebellar plate
	<ul style="list-style-type: none"> Cerebellum with marginal layer
	<ul style="list-style-type: none"> Fibers of dorsal funiculus reach level of C1
	<ul style="list-style-type: none"> First axodendritic synapses in cervical spinal cord
	<ul style="list-style-type: none"> First nerve fibers
	<ul style="list-style-type: none"> Habenular nucleus
	<ul style="list-style-type: none"> Habenulo-interpeduncular tract
	<ul style="list-style-type: none"> Lateral striatal ridge (derived from telencephalon and comprised mainly of neostriatum)
	<ul style="list-style-type: none"> Lateral ventricular eminence
	<ul style="list-style-type: none"> Locus caeruleus
	<ul style="list-style-type: none"> Longitudinal zones in diencephalon
	<ul style="list-style-type: none"> Marginal layer throughout most of diencephalon
	<ul style="list-style-type: none"> Material for sympathetic trunks scattered in cervical region
	<ul style="list-style-type: none"> Median striatal ridge (paleostriatum)
	<ul style="list-style-type: none"> Mesencephalic tract of CN 5
	<ul style="list-style-type: none"> Most cranial nerves seen
	<ul style="list-style-type: none"> Olfactory fibers reach brain
	<ul style="list-style-type: none"> Optic groove (also called preoptic recess)

	■ Postoptic recess
	■ Primordium of epiphysis
	■ Rhombomeres still identifiable
	■ Superior colliculi and its commissure
	■ Superior medullary velum
	■ Supramamillary commissure
	■ Synapses among motor neurons in spinal cord
	■ Tectobulbar tract
	■ Tentorium
	■ Third ventricle
	■ Trigemino-cerebellar tract
	■ Trochlear nerve root and decussation (CN IV)
	■ Hand plate emerges from distal upper limb bud
	□ Frontonasal prominence
5 weeks	■ ACTH [adrenocorticotropin hormone]
	■ Growth hormone
	■ Pituitary gland
	□ Limb buds form hand plates
	■ Permanent kidneys
	■ Arytenoid and epiglottal swellings
	■ Bronchial tree branching accelerates
	■ Lobar pattern mimics adult pattern
	■ T-shaped laryngeal inlet
	■ Pacemaker cells
	□ Head is one third of entire embryo

Unit 6: 5 to 6 Weeks

5 weeks, 1 day	□ Wrist joints are forming
5 weeks, 2 days	□ Apical epidermal ridges
	□ Mammary ridge
	□ Maxillary and premaxillary fields still widely separated
	□ Nipples emerge from mammary crest
	■ Gonad region separates from mesonephros
	■ Gonadal primordium
	■ Labioscrotal swelling
	■ Urogenital fold and groove
	■ Suprarenal gland: Cortex primordium
	■ Suprarenal gland: Medulla
	■ Thyroid detaches from pharynx
	■ Thyroid with right and left lobes connected by an isthmus
	□ Cartilage in mandibular arch
	□ Hand area with central carpal region and digital plate with marginal vein
	□ Pre-chondrocranium: Otic capsule, nasal capsule, and parachordal condensations

	<ul style="list-style-type: none"> □ Primordia of primary palate
	<ul style="list-style-type: none"> □ Ribs: Primordia now present for all 12 pairs
	<ul style="list-style-type: none"> □ Vertebral column with 36 levels of ganglia and myotomes
	<ul style="list-style-type: none"> ■ Extra-ocular premuscle masses receive cranial nerve fibers [oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves]
	<ul style="list-style-type: none"> ■ Gluteal mesoderm
	<ul style="list-style-type: none"> ■ Infrahyoid premuscle masses
	<ul style="list-style-type: none"> ■ Limb mesoderm
	<ul style="list-style-type: none"> ■ Sternocleidomastoid-trapezius premuscle mass with spinal accessory nerve (CN11)
	<ul style="list-style-type: none"> ■ Thigh and thigh mesoderm
	<ul style="list-style-type: none"> ■ Tongue premuscle mass
	<ul style="list-style-type: none"> ■ Metanephros at level of sacrum
	<ul style="list-style-type: none"> ■ Urethral plate
	<ul style="list-style-type: none"> ■ Lesser omentum (ventral mesogastrun)
	<ul style="list-style-type: none"> ■ Peritoneal cavity
	<ul style="list-style-type: none"> ■ Rectum
	<ul style="list-style-type: none"> ■ Stomach: Greater and lesser curvatures
	<ul style="list-style-type: none"> ■ Yolk stalk disappears
	<ul style="list-style-type: none"> ■ Bronchial tree expanding
	<ul style="list-style-type: none"> ■ Cervical sinus diminished in size
	<ul style="list-style-type: none"> ■ Epiglottis
	<ul style="list-style-type: none"> ■ Primitive Larynx
	<ul style="list-style-type: none"> ■ Anterior, middle, and posterior cerebral arteries
	<ul style="list-style-type: none"> ■ Atrioventricular (AV) node
	<ul style="list-style-type: none"> ■ Atrioventricular cushions fuse with interventricular septum
	<ul style="list-style-type: none"> ■ Circle of Willis almost complete
	<ul style="list-style-type: none"> ■ Conotruncal septum
	<ul style="list-style-type: none"> ■ Endocardial cushions (rostroventral and caudodorsal) begin fusing around atrioventricular canal forming right and left atrioventricular canals and two separate blood streams
	<ul style="list-style-type: none"> ■ External carotid artery
	<ul style="list-style-type: none"> ■ Foramen primum disappearing
	<ul style="list-style-type: none"> ■ Hepatic portal vein
	<ul style="list-style-type: none"> ■ Infundibulum of right ventricle
	<ul style="list-style-type: none"> ■ Jugular lymph sac
	<ul style="list-style-type: none"> ■ Lateral atrioventricular cushions
	<ul style="list-style-type: none"> ■ Mesencephalic artery
	<ul style="list-style-type: none"> ■ Myelencephalic artery
	<ul style="list-style-type: none"> ■ Perilental blood vessels
	<ul style="list-style-type: none"> ■ Primitive cavernous sinus drains primitive maxillary and supraorbital veins
	<ul style="list-style-type: none"> ■ Primitive renal plexus

	<ul style="list-style-type: none"> Right ventricle feeds sixth (pulmonary) aortic arches; left ventricle feeds fourth aortic arches
	<ul style="list-style-type: none"> Semilunar valves (aortic and pulmonary) are forming
	<ul style="list-style-type: none"> Ventricles each with three parts: inlet, trabecular pouch, and outflow tract
	<ul style="list-style-type: none"> Ventricles enlarge and deepen side-by-side forming an ever growing interventricular septum
	<ul style="list-style-type: none"> Celiac plexus
	<ul style="list-style-type: none"> Cochlear nerve present
	<ul style="list-style-type: none"> Femoral and obturator nerves innervate rostrolateral part of lower limb
	<ul style="list-style-type: none"> Hypoglossal nerve (CN XII) reaches tongue
	<ul style="list-style-type: none"> Intercostal nerves
	<ul style="list-style-type: none"> Lumbar and sacral plexuses
	<ul style="list-style-type: none"> Musculocutaneous, radial, ulna, and median nerves enter upper limb bud
	<ul style="list-style-type: none"> Nasal pits face more ventrally, still widely separated
	<ul style="list-style-type: none"> Nasofrontal groove
	<ul style="list-style-type: none"> Olfactory fibers connect nasal pits with brain
	<ul style="list-style-type: none"> Olfactory fibers enter brain
	<ul style="list-style-type: none"> Olfactory tubercle present
	<ul style="list-style-type: none"> Peroneal and tibial nerves innervate caudomedial part of lower limb
	<ul style="list-style-type: none"> Phrenic nerve
	<ul style="list-style-type: none"> Pigment in retina visible externally
	<ul style="list-style-type: none"> Primordium of cochlear pouch
	<ul style="list-style-type: none"> Tibial nerve innervates foot area
	<ul style="list-style-type: none"> Auricular hillocks on hyoid arch (antitragus and helix)
	<ul style="list-style-type: none"> Auricular hillocks on mandibular arch (tragus and crus)
	<ul style="list-style-type: none"> Blind nasal sac
	<ul style="list-style-type: none"> Nasal fin
	<ul style="list-style-type: none"> Alar lamina emerging with dense rhombic lip
	<ul style="list-style-type: none"> All cranial nerves identifiable
	<ul style="list-style-type: none"> Archipallium, paleopallium, and neopallium
	<ul style="list-style-type: none"> Area epithelialis
	<ul style="list-style-type: none"> Brain: Primordial plexiform layer in area of future temporal lobe
	<ul style="list-style-type: none"> Cajal-Retzius cells
	<ul style="list-style-type: none"> Commissure of the trochlear nerve
	<ul style="list-style-type: none"> Diencephalic subthalamic nucleus
	<ul style="list-style-type: none"> Dorsal and ventral thalami separated by groove
	<ul style="list-style-type: none"> Dorsal funiculus fibers reach medulla oblongata
	<ul style="list-style-type: none"> Epiphysis cerebri
	<ul style="list-style-type: none"> Glial cells identifiable adjacent to neurons
	<ul style="list-style-type: none"> Greater petrosal nerve
	<ul style="list-style-type: none"> Hippocampus: Gyrus dentatus

	■ Infundibular recess and infundibulum
	■ Interventricular foramen large
	■ Marginal ridge
	■ Medial and lateral ridges of corpus striatum are continuous
	■ Median forebrain bundle
	■ Neurohypophysial outgrowth
	■ Olfactory tubercle
	■ Pontine flexure deepens
	■ Posterior commissure
	■ Recurrent laryngeal nerve
	■ Reticular formation more defined
	■ Retinal fissure closes
	■ Splanchnic nerve
	■ Sulcus limitans hippocampi
	■ Superior laryngeal nerve
	□ Second pharyngeal arch more prominent
	□ Third pharyngeal arch recedes
5½ weeks	□ Initial tooth formation
5½ weeks - 6 weeks	■ Subtle movement begins
5 weeks, 4 days	□ Cartilage formation
5 weeks, 5 days	■ Nerve cells differentiating
5 weeks, 5 days - 7 weeks, 1 day	□ Melanocytes in epidermis
5 weeks, 6 days	□ Facial growth centers grow and begin merging forming nose and upper jaw
	■ Genital eminence forms phallus or genital tubercle
	■ Gonad grows into oval shape with irregular surface
	□ Auditory ossicles identifiable in mesenchyme
	□ Cartilage in occipital sclerotomes (1-4)
	□ Digital rays in hand plate
	□ Femur: Chondrification begins
	□ Foot with rounded digital plate
	□ Hypoglossal foramen (or canal) through sclerotome 4 (area of future occipital bone)
	□ Odontogenic epithelium emerges in six areas (four maxillary and two mandibular)
	□ Primary palate components (right and left) fuse in midline
	□ Primitive palatine groove
	□ Primordium of cartilage within nasal septum
	□ Vertebral centra begin chondrification
	■ Primordia of orbital muscles
	■ Calices
	■ Mesonephros can produce urine
	■ Pelvis of the ureter with three main divisions

	<ul style="list-style-type: none"> Vesico-urethral canal
	<ul style="list-style-type: none"> Biliary ducts within liver
	<ul style="list-style-type: none"> Dorsal and ventral pancreas fuse but retain separate ducts
	<ul style="list-style-type: none"> Duodenum enlarges proximal to and distal to bile and pancreatic ducts
	<ul style="list-style-type: none"> Esophagus developing a submucous coat surrounding epithelium
	<ul style="list-style-type: none"> Intestinal loop begins umbilical herniation
	<ul style="list-style-type: none"> Primordial vermiform appendix
	<ul style="list-style-type: none"> Stomach regions include gastric canal, fundus, corpus (or body), and pyloric antrum
	<ul style="list-style-type: none"> Trachea: Precursors of tracheal cartilages
	<ul style="list-style-type: none"> Condensing mesenchyme around junction between left and right atria and cardiac tube is precursor to mitral and tricuspid valves
	<ul style="list-style-type: none"> Outflow tract rotates counterclockwise
	<ul style="list-style-type: none"> Right and left atrioventricular canals totally separated
	<ul style="list-style-type: none"> All parasympathetic cranial nerve ganglia identifiable
	<ul style="list-style-type: none"> All spinal nerves present
	<ul style="list-style-type: none"> Cell islands in olfactory tubercle
	<ul style="list-style-type: none"> Crescentic lens cavity
	<ul style="list-style-type: none"> Geniculate ganglion separate from vestibulocochlear nerve
	<ul style="list-style-type: none"> Globular process emerges from each medial nasal process
	<ul style="list-style-type: none"> Nasal fin connecting nasal disc and surface epithelium
	<ul style="list-style-type: none"> Nasofrontal grooves
	<ul style="list-style-type: none"> Olfactory tubercle with cellular islands
	<ul style="list-style-type: none"> Hyomandibular groove enlarges (onset of concha and external auditory meatus formation)
	<ul style="list-style-type: none"> Medial rims of nasal pits form nasal septum
	<ul style="list-style-type: none"> Nostril becomes continuous with nasal sac
	<ul style="list-style-type: none"> Primary lens fibers
	<ul style="list-style-type: none"> Retinal fissure closed
	<ul style="list-style-type: none"> Capillaries between adenohipophysis and hypothalamus
	<ul style="list-style-type: none"> Commissure of the oculomotor nerves
	<ul style="list-style-type: none"> Cortical nucleus in amygdaloid body
	<ul style="list-style-type: none"> Dentate and isthmic nuclei in cerebellum
	<ul style="list-style-type: none"> Dura begins forming in basal area
	<ul style="list-style-type: none"> Epiphysis cerebri with intermediate layer
	<ul style="list-style-type: none"> First hint of septal nucleus
	<ul style="list-style-type: none"> Frontal and temporal poles of cerebral hemispheres
	<ul style="list-style-type: none"> Gustatory fibers separate from common afferent tract
	<ul style="list-style-type: none"> Hemispheric stalk
	<ul style="list-style-type: none"> Intermediate layer in tectum mesencephali

	■ Interventricular foramen
	■ Mesencephalon with intermediate layer
	■ Somites: Pairs 38 and 39
	■ Spinal cord reaches caudal tip of body
	■ Subarachnoid space
	■ Synapses in spinal cord between interneurons and primary afferent neurons
	■ Ventral thalamus with intermediate layer
	■ Anterior choroid artery
6 weeks	■ Face withdraws from light touch around mouth
	■ Blood forming in liver
	■ Milk lines
	■ Nipples along side of trunk
	■ Adrenal glands
	■ Glucagon in pancreas
	■ Handplates develop subtle flattening
	■ Joints
	■ Medial skull cartilages: Parachordal, hypophyseal, and trabecular
	■ Tooth buds (primary teeth)
	■ Diaphragm is largely formed
	■ Intestines fill base of umbilical cord
	■ External ears
	■ Synapses form in spinal cord
	■ Crown-heel length 1.6 cm

Unit 7: 6 to 7 Weeks

6 weeks, 2 days	■ Angiogenesis begins inside gonads
	■ Gonad grows into oval shape with irregular surface
	■ Ostium (abdominal) of uterine tube at rostral end of paramesonephric duct (in female embryos)
	■ Paramesonephric duct forms from rostral end of mesonephric duct
	■ Testicular cords in gonads of male embryos
	■ Testicular cords in male gonad
	■ Elbow regions sometimes identifiable
	■ Embryo with cervical and lumbar flexures
	■ Embryo with dorsal concavity
	■ Finger rays with early interdigital notching
	■ Hands polygon-shaped
	■ Humerus, radius, and ulna
	■ Humerus: Chondrocytes in phases one through three
	■ Scapula and clavicle
	■ Semicircular ducts form in order: anterior, posterior, and lateral
	■ Sternum: Episternal cartilage created from fusion of right and left sternal bars

	□ Tibia and fibula
	□ Toe rays sometimes present
	■ Deltoid muscle
	■ External and internal abdominal oblique muscles
	■ Levator scapulae muscle
	■ Longus cervicis and semispinalis cervicis muscles
	■ Pectoralis major muscles
	■ Platysma muscle
	■ Rectus abdominis muscle
	■ Rectus capitis posterior and semispinalis capitis muscles
	■ Serratus anterior muscles
	■ Splenius and longissimus muscles
	■ Stapedius muscle
	■ "Common excretory duct is disappearing"
	■ Cloacal membrane ruptures (stages 18-19)
	■ Primordia of secretory tubules
	■ Esophagus with muscular and submucous coats
	■ Submandibular gland primordia
	■ Bronchial tree with subsegmental buds
	■ Bronchial tree with well established segmental bronchi
	■ Lingula of left upper lobe
	■ Aortic and pulmonary valves assuming shape of a cup
	■ Brachiocephalic veins, right and left
	■ Inferior vena cava
	■ Interventricular septum: membranous part begins forming
	■ Left coronary artery arises from aorta
	■ Mesenchyme ridges in place of future mitral and tricuspid valves
	■ Pulmonary and aortic blood flows completely separate
	■ Secondary interventricular foramen sometimes closing (stage 18-21) interventricular septum
	■ Septum secundum and foramen ovale (stages 18-21)
	■ Bucconasal membrane
	■ Bucconasal membrane detaches opening up nasal airway
	■ Crus commune
	■ Ethmoidal epithelium emerges from upper medial nasal wall
	■ Frontonasal angle (marks location of future nasal bridge)
	■ Mesenchyme thickenings mark beginning of "sclera and its muscular attachments"
	■ Nasal tip emerges
	■ Nerve fibers in retina
	■ Optic fibers

	Retina's outer lamina heavily pigmented
	Vomerolateral nerve and ganglion
	Vomerolateral organ marked by groove and located in fold of lower medial nasal wall
	Choanae
	Conjunctival sac marked by groove
	Cornea and conjunctiva
	Ear: Stapes primordium surrounds stapedia artery
	External ear: Crus helices forming from auricular hillocks two and three (from mandibular arch)
	Eyelid folds sometimes present
	Nasal fin splits forming choanae and buccal membrane
	Nasolacrimal duct begins as epithelial strand emanating from nasomaxillary groove
	Nostrils, nasal wings, and nasal septum easily seen
	Olfactory bulb sometimes with olfactory ventricle
	Primary lens fibers filling lens vesicle cavity
	Adenohypophysis no longer open to pharyngeal cavity
	Archistriatum
	Brain: Dentate nucleus in internal cerebellar swellings
	Brain: Pineal recess emerges representing anterior lobe of epiphysis
	Brainwave activity has begun
	Cerebrospinal fluid production begins
	Choroid plexuses in fourth and lateral ventricles
	Corpus striatum much larger extending to preoptic sulcus; has subtle groove
	External cerebellar swellings contain future flocculus
	Four amygdaloid nuclei
	Fourth ventricle: Choroid folds
	Hippocampus reaches olfactory region
	Interpeduncular fossa
	Neurohypophysis walls are folded
	Nucleus ambiguus of the vagus (CN10)
	Prosencephalic septum
	Red nucleus
	Substantia nigra
	Supra-optic commissure
6½ weeks	The hands begin to move
	Volar pads on palms
	Bones first form in the collar bones and lower jaw
6 weeks, 5 days	Greater thymic bud
	Cheeks form by merging of maxillary and mandibular processes
	Mammary gland primordium

	<ul style="list-style-type: none"> <input type="checkbox"/> Mammary ridge disappears leaving only mammary gland primordium
	<ul style="list-style-type: none"> <input type="checkbox"/> Female duct
	<ul style="list-style-type: none"> <input type="checkbox"/> Gonads extend from levels T-10 to L-2
	<ul style="list-style-type: none"> <input type="checkbox"/> Rete ovarii (in female embryos)
	<ul style="list-style-type: none"> <input type="checkbox"/> Rete testis begins emerging from seminiferous cords (Stage 19-23) (in male embryos)
	<ul style="list-style-type: none"> <input type="checkbox"/> Tunica albuginea in male embryos
	<ul style="list-style-type: none"> <input type="checkbox"/> Suprarenal gland: Cortex
	<ul style="list-style-type: none"> <input type="checkbox"/> Suprarenal gland: Medulla populated by prechromaffin cells
	<ul style="list-style-type: none"> <input type="checkbox"/> Arms point forward
	<ul style="list-style-type: none"> <input type="checkbox"/> Beginnings of occipital and sphenoid bones
	<ul style="list-style-type: none"> <input type="checkbox"/> Bilateral cartilaginous sternal bars tie ribs together; sternal bars join cranially to form the episternal bar in the midline
	<ul style="list-style-type: none"> <input type="checkbox"/> Cartilage within otic capsule envelops semicircular canals and cochlear duct
	<ul style="list-style-type: none"> <input type="checkbox"/> Cartilaginous styloid process
	<ul style="list-style-type: none"> <input type="checkbox"/> Ear: Cartilaginous malleus, incus, and stapes (the middle ear ossicles)
	<ul style="list-style-type: none"> <input type="checkbox"/> Ectomeninx covers lateral and dorsal surfaces of brain (laying the foundation for the flat bones of the skull)
	<ul style="list-style-type: none"> <input type="checkbox"/> Intervertebral discs form from caudal condensed portion of sclerotomes
	<ul style="list-style-type: none"> <input type="checkbox"/> Ischium and ilium
	<ul style="list-style-type: none"> <input type="checkbox"/> Labiodental lamina: Inner dental lamina and outer labi gingival band
	<ul style="list-style-type: none"> <input type="checkbox"/> Laryngeal cartilages
	<ul style="list-style-type: none"> <input type="checkbox"/> Limbs point forward (ventrally)
	<ul style="list-style-type: none"> <input type="checkbox"/> Orbitosphenoid cartilage located within ectomeninx near optic stalk
	<ul style="list-style-type: none"> <input type="checkbox"/> Ossification begins in maxilla (stages 19 -20)
	<ul style="list-style-type: none"> <input type="checkbox"/> Primitive palate (or intermaxillary segment)
	<ul style="list-style-type: none"> <input type="checkbox"/> Rib primordia become cartilaginous
	<ul style="list-style-type: none"> <input type="checkbox"/> Ribs each have an identifiable head and shaft
	<ul style="list-style-type: none"> <input type="checkbox"/> Trachea: Tracheal cartilage
	<ul style="list-style-type: none"> <input type="checkbox"/> U-shaped labiodental lamina form along upper and lower oral cavity
	<ul style="list-style-type: none"> <input type="checkbox"/> Vertebral column represented by cartilaginous centrum, neural arch, and short transverse process
	<ul style="list-style-type: none"> <input type="checkbox"/> Esophagus: Muscularis layer adjacent to esophageal plexus
	<ul style="list-style-type: none"> <input type="checkbox"/> Gluteal muscle group
	<ul style="list-style-type: none"> <input type="checkbox"/> Iliopsoas muscles
	<ul style="list-style-type: none"> <input type="checkbox"/> Infrahyoid muscles
	<ul style="list-style-type: none"> <input type="checkbox"/> Internal intercostal muscles
	<ul style="list-style-type: none"> <input type="checkbox"/> Limb extensor muscles located dorsally

	<ul style="list-style-type: none"> ■ Limb flexor muscles located ventrally
	<ul style="list-style-type: none"> ■ Midgut: Muscularis
	<ul style="list-style-type: none"> ■ Muscle tissue forming around phrenic nerve within septum transversum portion of diaphragm
	<ul style="list-style-type: none"> ■ Pharyngeal constrictor muscle
	<ul style="list-style-type: none"> ■ Premuscle mass of the muscles of mastication innervated by mandibular nerve
	<ul style="list-style-type: none"> ■ Quadratus lumborum muscle
	<ul style="list-style-type: none"> ■ Rhomboid and scalene muscles
	<ul style="list-style-type: none"> ■ Sternocleidomastoid and trapezius muscles distinct and innervated by separate branches of spinal accessory nerve (CN XI)
	<ul style="list-style-type: none"> ■ Thenar and hypothenar eminences
	<ul style="list-style-type: none"> ■ Tongue forms from swellings in floor of pharynx
	<ul style="list-style-type: none"> ■ Tongue: Extrinsic muscles identifiable
	<ul style="list-style-type: none"> ■ Tongue: Intrinsic muscles identifiable
	<ul style="list-style-type: none"> ■ Transversospinal and erector spinae muscle groups
	<ul style="list-style-type: none"> ■ Upper limb flexors innervated by musculocutaneous, median, and ulnar nerves
	<ul style="list-style-type: none"> ■ Major calyces, cranial and caudal, with collecting tubules within metanephrogenic mass
	<ul style="list-style-type: none"> ■ Mesonephros extends from T-9 to L-3
	<ul style="list-style-type: none"> ■ Metanephros extends from T-12 to L-2
	<ul style="list-style-type: none"> ■ Renal capsule covers distal collecting tubules
	<ul style="list-style-type: none"> ■ Renal vesicles form in part of metanephros
	<ul style="list-style-type: none"> ■ Ureter forms from "proximal segment of metanephric diverticulum"
	<ul style="list-style-type: none"> ■ Urogenital sinus comprised of three parts: Bladder, pelvic, and phallic portions
	<ul style="list-style-type: none"> ■ Anal folds adjacent to anal membrane
	<ul style="list-style-type: none"> ■ Anal membrane
	<ul style="list-style-type: none"> ■ Duodenum: "Assumes the shape of an arc"
	<ul style="list-style-type: none"> ■ Greater omentum
	<ul style="list-style-type: none"> ■ Lateral palatine process
	<ul style="list-style-type: none"> ■ Liver: rapid growth, right side greater than left
	<ul style="list-style-type: none"> ■ Median mandibular groove disappears as mandibular processes merge in midline
	<ul style="list-style-type: none"> ■ Palatine fossa (from pharyngeal pouch 2)
	<ul style="list-style-type: none"> ■ Primitive oral cavity
	<ul style="list-style-type: none"> ■ Primitive rima oris replaces stomodeum
	<ul style="list-style-type: none"> ■ Stomach wall layers: Mucosa, submucosa, muscularis, and serosa
	<ul style="list-style-type: none"> ■ Submandibular and parotid gland buds
	<ul style="list-style-type: none"> ■ Submandibular gland duct
	<ul style="list-style-type: none"> ■ Bronchial tree: First generation of subsegmental bronchi complete
	<ul style="list-style-type: none"> ■ Glottis, primitive

	<ul style="list-style-type: none"> ■ Lung sac, right: Oblique and horizontal fissures define upper, lower, and middle lobes
	<ul style="list-style-type: none"> ■ Lung sac: Apex and base
	<ul style="list-style-type: none"> ■ Lung, left: Oblique fissure defines upper and lower lobes ■ "Septum primum fuses with endocardial cushions" obliterating ostium primum and creating the ostium secundum
	<ul style="list-style-type: none"> ■ Apex of left ventricle ■ Circulus arteriosus (Circle of Willis) complete
	<ul style="list-style-type: none"> ■ External iliac arteries ■ Iliac lymph sac
	<ul style="list-style-type: none"> ■ Intercostal and subcostal arteries ■ Internal thoracic artery and costocervical trunk
	<ul style="list-style-type: none"> ■ Mesenteric lymph sac ■ Mesonephric artery feeds mesonephros, gonads, and suprarenal glands ■ Papillary muscles
	<ul style="list-style-type: none"> ■ Pontine, superior cerebellar, and anterior and posterior inferior cerebellar arteries replace myelencephalic and metencephalic arteries ■ Primitive marginal sinus drains diencephalon ■ Primitive tentorial sinus drains cerebral vesical ■ Primitive transverse and sigmoid sinuses
	<ul style="list-style-type: none"> ■ Pulmonary arteries (right and left) ■ Right coronary artery arises from aorta ■ Splenic vein ■ Tricuspid and mitral valves
	<ul style="list-style-type: none"> ■ Anterior chamber between iridopupillary membrane and thickened ectoderm ■ Auditory tube and primitive tympanic cavity form from tubotympanic recess pharyngeal pouch 1) ■ Celiac, superior mesenteric, and inferior mesenteric preaortic ganglia ■ Choana ■ Cochlear duct tip grows upward ■ Esophageal plexus formed by vagal nerves (CN X) ■ Facial nerve (CN VII) branches: Chorda tympani, greater petrosal, posterior auricular, and digastric ■ Facial nerve (CN VII) reaches cervicomandibular region ■ Glossopharyngeal nerve (CN IX) innervates stylopharyngeus pre-muscle mass ■ Hypoglossal nerve (CN XII) innervates separating tongue muscles ■ Linguogingival groove ■ Nasolacrimal duct forms from maxillonasal groove ■ Nasolacrimal ducts extend from medial eyes to primitive nasal cavity

	 Nerve fibers begin extending from retina
	 Optic fibers enter chiasmatic plate
	 Primitive nasal cavity
	 Primordial vitreous body
	 Superior, middle, and inferior cervical ganglia
	 Trigeminal nerve (CN V) with ophthalmic, maxillary, and mandibular divisions reach their destinations
	 Vagal trunks, anterior and posterior, extending into abdomen
	 Eyelids: Upper and lower lids present and growing
	 Sacculle and cochlear duct
	 Adenohypophysis: Lateral lobes of pars tuberalis
	 Adenohypophysis: Pars intermedia emerging
	 Brain: Internal capsule formation underway
	 Cerebral hemispheres cover half of diencephalon
	 Dorsal and ventral cochlear nuclei
	 Fourth ventricle: Lateral recesses
	 Ganglion of nervus terminalis
	 Globus pallidus externus in the diencephalon
	 Habenular commissure
	 Intermediate layer in dorsal thalamus
	 Lemniscal decussation
	 Lower limb nerves (femoral, obturator, sciatic, common peroneal, and tibial) identifiable
	 Medial accessory olivary nucleus
	 Neurohypophyseal bud
	 Nuclei of forebrain septum
	 Nucleus accumbens
	 Occipital pole of cerebral hemispheres
	 Optic stalk with barely discernible lumen
	 Paraphysis marks dividing line in roof between telencephalon and diencephalon
	 Primitive filum terminale
	 Radial nerve innervates upper limb extensors
	 Rhombomeres no longer distinguishable
	 Subcommissural organ
	 Zona limitans intrathalamica between dorsal and ventral thalami
6 weeks, 6 days	 Feet polygon-shaped
	 Cloacal membrane ruptures
7 weeks	 Head rotates
	 Leg movements
	 B lymphocytes in liver
	 Ovaries
	 Testes begin to differentiate
	 Insulin in pancreas

	<ul style="list-style-type: none"> □ Foot plates notched ■ Hiccups ■ Tendons attach muscle to bone ■ The heart has four chambers and is nearly complete. ■ The heart rate peaks at 165 to 170 beats per minute. □ Crown-heel length 2.2 cm
--	--

Unit 8: 7 to 8 Weeks

7 weeks, 1 day	<ul style="list-style-type: none"> □ Facial processes no longer distinguishable □ Ovaries full of primitive oogonia, intermediate pregranulosa cells, and mesenchyme □ Testes with short straight tubules □ Upper limbs with slightly flexed elbows ■ Diaphragm: Central tendon ■ Renal vesicles with S-shaped lumina ■ Submandibular gland: Solid epithelial ducts enlarge and begin to branch ■ Adenohypophysis with new capillaries on rostral surface ■ Scalp vascular plexus ■ Cochlear duct tip growing horizontally ■ Lens cavity completely filled ■ Optic commissure ■ Optic fibers extend to optic chiasma ■ Cornea with three layers ■ Brain: Inferior colliculus (in mesencephalon) ■ Cerebral hemispheres expand beyond lamina terminalis ■ Cerebral hemispheres extend over two-thirds of diencephalon ■ Interpeduncular groove ■ Medial septal nucleus ■ Nigrostriatal fibers ■ Nucleus of diagonal band ■ Sacrocaudal spinal cord formation (secondary neurulation) complete ■ Sensory pathways: Cuneate and gracile decussating fibers ■ Septum verum ■ Spinothalamic tract
7 weeks, 1 day - 8 weeks	<ul style="list-style-type: none"> ■ Stomach: Folds in stomach wall
7 weeks, 2 days	<ul style="list-style-type: none"> ■ Arteries and veins of heart complete
7 weeks, 3 days	<ul style="list-style-type: none"> □ Volar pads begin to emerge on fingertips □ Chondrocranium with dorsum sellae and hypophysial fossa □ Dens (of second cervical vertebrae) □ Sternoclavicular joint and manubrium

	<input type="checkbox"/> The knee joints have arrived
	<input type="checkbox"/> Trachea: Thyroid cartilage
	<input type="checkbox"/> Wrists slightly flexed
	<input checked="" type="checkbox"/> Gluteus medius and gluteus minimus muscles
	<input checked="" type="checkbox"/> Iliacus muscles
	<input checked="" type="checkbox"/> Mylohyoid and infrahyoid muscles
	<input checked="" type="checkbox"/> Orbicularis oculi muscles
	<input checked="" type="checkbox"/> Submandibular gland: Solid ducts with definitive branches
	<input checked="" type="checkbox"/> Anterior and posterior choroid arteries
	<input checked="" type="checkbox"/> Left superior vena cava disappears (Stages 21-23)
	<input checked="" type="checkbox"/> Scalp vascular plexus moving toward vertex
	<input checked="" type="checkbox"/> Cornea: Substantia propria layer
	<input checked="" type="checkbox"/> Fibers of optic nerve reach brain
	<input checked="" type="checkbox"/> Eyelids growing rapidly
	<input checked="" type="checkbox"/> Anterior and inferior horns of lateral ventricle
	<input checked="" type="checkbox"/> Brain: Insula within cerebral hemisphere
	<input checked="" type="checkbox"/> C-shaped lateral ventricle
	<input checked="" type="checkbox"/> Cerebral hemispheres cover 75% of diencephalon
	<input checked="" type="checkbox"/> Cerebral hemispheres cover more than half of diencephalon
	<input checked="" type="checkbox"/> Cortical plate within primordial plexiform layer
	<input checked="" type="checkbox"/> Glial and neurilemmal (Schwann) cells within cranial nerves
	<input checked="" type="checkbox"/> Globus pallidus internus
	<input checked="" type="checkbox"/> Internal fiber layer of cerebellum
	<input checked="" type="checkbox"/> Lateral olfactory tract
	<input checked="" type="checkbox"/> Primordium of dentate nucleus
	<input checked="" type="checkbox"/> Pyramidal cells in hippocampus
	<input checked="" type="checkbox"/> Subthalamic nucleus proper, entopeduncular nucleus, and globus pallidus externus within subthalamus
	<input checked="" type="checkbox"/> Sulcus transversus rhombencephali
	<input checked="" type="checkbox"/> Ventral part of lateral geniculate body
7½ weeks	<input checked="" type="checkbox"/> Hands begin to touch face
	<input checked="" type="checkbox"/> The hands touch each other as do the feet!
	<input checked="" type="checkbox"/> Fingertips thicken
	<input checked="" type="checkbox"/> Plantar pads toes
	<input checked="" type="checkbox"/> EKG pattern similar to adult
7 weeks, 4 days	<input type="checkbox"/> The fingers are free
7 weeks, 5 days	<input type="checkbox"/> Bone-forming cells called osteoblasts emerge
	<input type="checkbox"/> Bone-forming cells emerge
	<input type="checkbox"/> Endolymphatic and jugular foramina
	<input type="checkbox"/> Hands can reach one another and fingers can overlap
	<input type="checkbox"/> Optic foramen, foramen rotundum, internal acoustic foramen
	<input type="checkbox"/> Osteoblasts emerge

	□ Pelvis: Obturator foramen
	■ Obturator internus muscles
	■ Rectus femoris muscle
	■ Large glomeruli present within metanephros
	■ Submandibular gland: Secondary branching with lumen formation starting at oral end of duct
	■ Costodiaphragmatic recess of pleural cavity
	■ Chordae tendineae (Stages 22 and 23)
	■ Intradural veins (sinuses)
	■ Scalp vascular plexus 75% of the way to the vertex
	■ Cochlear duct's second loop growing upward
	■ Scleral condensation
	■ Tragus and antitragus taking shape
	■ Eyelids continue growing rapidly over the surface of the cornea
	■ Optic nerve acquires a sheath
	■ Brain: Claustrum
	■ Brain: Cortical plate within cerebral hemispheres
	■ Brain: Internal capsule with connections to epithalamus, dorsal thalamus, and mesencephalon
	■ Brain: Putamen
	■ Cerebral hemispheres cover 75% of diencephalon
	■ Commissural plate thickens
	■ Cortical plate expanding rapidly
	■ Folds in roof of third ventricle
	■ Nerve fibers between neopallial subplate and internal capsule
	■ Thalamocortical fibers
7 weeks, 6 days	□ The toes are free
8 weeks	■ Complex response to touch
	■ More frequent hand-to-face contact
	■ Mouth opens & closes
	■ Squinting
	■ The embryo floats and rolls over in the womb
	■ Hairs first appear in eyebrows & around mouth
	■ Skin multi-layered, loses transparency
	■ Ductus deferens
	■ Interstitial cells forming within testis
	■ Testicular tubules
	■ Male embryos are making testosterone already!
	□ Anterior inferior iliac spine
	□ Costal cartilage
	□ Enamel organ
	□ Femur: Head and acetabular fossa
	□ Glenoid fossa
	□ Greater trochanter

	<input type="checkbox"/> Head of humerus
	<input type="checkbox"/> Inguinal ligament
	<input type="checkbox"/> Joint development: Cavitation underway in hip, knee, and ankle (in some embryos)
	<input type="checkbox"/> Joint development: Cavitation underway in shoulder, elbow, and wrist (in some embryos)
	<input type="checkbox"/> Nucleus pulposus (from notochord)
	<input type="checkbox"/> Ossification underway in scapula and distal phalanges in some embryos
	<input type="checkbox"/> Pubic symphysis
	<input type="checkbox"/> Scapular spine and notch
	<input type="checkbox"/> Skull: Foramen magnum (wide)
	<input type="checkbox"/> Skull: Ossification underway in some embryos
	<input type="checkbox"/> Superior and inferior pubic rami
	<input type="checkbox"/> The embryo's joints are similar to adult joints
	<input type="checkbox"/> Ulna: Styloid process and olecranon
	<input type="checkbox"/> Vertebrae cartilaginous (33 or 34 in number)
	<input checked="" type="checkbox"/> Anterior digastric muscles
	<input checked="" type="checkbox"/> Depressor anguli oris muscle
	<input checked="" type="checkbox"/> Diaphragm complete
	<input checked="" type="checkbox"/> Esophagus: Longitudinal muscles
	<input checked="" type="checkbox"/> Obliquus superior capitus muscle
	<input checked="" type="checkbox"/> Obturator externus, gluteus maximus, and hamstring muscles
	<input checked="" type="checkbox"/> Posterior belly of the digastric muscle
	<input checked="" type="checkbox"/> Psoas tendon
	<input checked="" type="checkbox"/> Rectus sheath with anterior and posterior lamina
	<input checked="" type="checkbox"/> Temporal and lateral pterygoid muscles
	<input checked="" type="checkbox"/> Zygomaticus major muscle
	<input checked="" type="checkbox"/> Kidneys at level of first three lumbar vertebrae
	<input checked="" type="checkbox"/> Metanephros: Numerous large glomeruli
	<input checked="" type="checkbox"/> Metanephros: Secretory tubules elongating and becoming convoluted
	<input checked="" type="checkbox"/> Sinusal tubercle
	<input checked="" type="checkbox"/> Urethra
	<input checked="" type="checkbox"/> Urine production and release
	<input checked="" type="checkbox"/> Gastrolial ligament
	<input checked="" type="checkbox"/> Nerves reaching intestinal loop
	<input checked="" type="checkbox"/> Peristalsis in large intestine
	<input checked="" type="checkbox"/> Submandibular gland: Lumen present in terminal portions of duct
	<input checked="" type="checkbox"/> Submandibular gland: Mesodermal sheath surrounds gland
	<input checked="" type="checkbox"/> Unfused uvula (edge of unfused palatine shelf) and secondary palate
	<input checked="" type="checkbox"/> Occasional breathing motions begin
	<input checked="" type="checkbox"/> Pseudoglandular stage begins

	Azygos vein
	Blood supply to the brain closely resembles adult pattern
	Hemiazygos veins
	Inferior epigastric artery
	Inferior vena cava valve at junction of right atrium
	Scalp vascular plexus nearing vertex
	Submandibular glands: Angiogenesis begins around epithelial tree (ducts)
	Superior sagittal sinus
	Cochlear duct's 2.5 coils nearly complete
	Cranial nerve distribution mimics adult pattern
	Ear drum
	Eye: Secondary vitrous body
	Lens: Secondary lens fibers emerging
	Retina: Eight layers present
	Retina: Four of the ten adult layers present
	Tympanic membrane
	Eyelids fusing laterally and medially
	Optic tract reaches ventral portion of lateral geniculate body
	"The hindbrain "presents striking resemblance to that of the newborn."
	"The rhombencephalon...presents striking resemblance to that of the newborn."
	Amygdala area
	Brain represents 43% of embryo
	Brain: Caudate nucleus and putamen within corpus striatum
	Cerebellar commissures
	Cerebellum with external germinal layer
	Cerebral hemispheres cover lateral portion of diencephalon
	Choroid plexus now lobular
	Cortical plate covers nearly all of neopallial surface
	Dura lines entire vertebral canal
	Fasciculus cuneatus and fasciculus gracilis form the decussation of the medial lemnisci
	Greater palatine nerve
	Grey and white matter
	Hippocampus reaches temporal pole
	Inferior and superior cerebellar peduncles
	Most cisterns present
	Principal nucleus of inferior olivary nuclei
	Pyramidal decussations
	Right- and left-handedness emerges
	Suprapineal recess

	<ul style="list-style-type: none"> ■ Suprascapular nerve ■ Vermis of cerebellum Crown-heel length 4.3 cm Embryo contains approximately 1 billion (10⁹) cells Embryonic Period Ends The 8-week embryo has formed more than 4,000 permanent body parts.
--	--

Unit 9: 8 to 9 Weeks

8 weeks, 1 day	<ul style="list-style-type: none"> ■ Humerus: Bone marrow replaces cartilage
8 weeks, 1 day - 9 weeks	<ul style="list-style-type: none"> ■ Anal canal patent
8½ weeks	<ul style="list-style-type: none"> ■ Eyelids completely fused
9 weeks	<ul style="list-style-type: none"> ■ Neurons synapse in cerebral cortex (marginal zone) ■ Bends hip & knee if sole of foot touched ■ Drinking fluid is becoming routine ■ Sucking the thumb ■ The young fetus now sighs, stretches, moves the head, opens the mouth, and moves the tongue ■ Tongue movement Female fetuses have early reproductive cells in their ovaries Thyroid gland weighs 2 grams ■ Small intestine peristalsis ■ External capsule ■ Face, hands, and feet sense light touch ■ Olivary nucleus with five components

Unit 10: 9 to 10 Weeks

9 weeks - 10 weeks	<ul style="list-style-type: none"> ■ Early vocal cords ■ Larynx recanalizes My weight will rise more than 75% this week
9½ weeks	<ul style="list-style-type: none"> ■ I yawn when I want
9 weeks, 4 days	<ul style="list-style-type: none"> ■ Yawns
10 weeks	<ul style="list-style-type: none"> ■ Eyes roll downward reflexively ■ Palatine tonsils Fingernails and toenails begin to grow! Three-layered epidermis Tiny unique fingerprints have arrived! Now, all the bones are getting harder Tooth buds (secondary teeth) ■ Glomeruli formation begins ■ Physiologic herniation ends ■ Commissure of the fornix ■ Corpus callosum begins Crown-heel length 7.5 cm

Unit 11: 10 to 11 Weeks

10 weeks - 12 weeks	<ul style="list-style-type: none"> ■ Langerhans cells enter epidermis
----------------------------	---

10½ weeks	—	<input type="checkbox"/> Volar and plantar pads regress
11 weeks	—	<input checked="" type="checkbox"/> The face now makes complex expressions
		<input checked="" type="checkbox"/> Immunological competence
		<input type="checkbox"/> Intermediate layer
		<input type="checkbox"/> Nose & lips completely formed
		<input checked="" type="checkbox"/> Now you can tell if your baby is a girl or a boy!
		<input checked="" type="checkbox"/> Thyroid gland weighs 12 grams
		<input checked="" type="checkbox"/> Intestines absorb water & glucose
		<input checked="" type="checkbox"/> Small intestine lined with villi
		<input checked="" type="checkbox"/> Auditory cells: inner & outer hair cells
		<input type="checkbox"/> Crown-heel length

Unit 12: 11 to 12 Weeks

11 weeks - 12 weeks	—	<input type="checkbox"/> Weight increases by 60% this week
12 weeks	—	<input checked="" type="checkbox"/> Hands touch the mouth up to 50 times per hour
		<input checked="" type="checkbox"/> T lymphocytes leave thymus
		<input type="checkbox"/> Sebaceous glands
		<input checked="" type="checkbox"/> Many different hormones are present in pituitary gland
		<input checked="" type="checkbox"/> Thyroid gland produces hormone
		<input type="checkbox"/> Palate fuses
		<input type="checkbox"/> Upper limbs reach final proportion
		<input checked="" type="checkbox"/> All facial muscles in final positions
		<input checked="" type="checkbox"/> Bladder resembles smooth muscle
		<input checked="" type="checkbox"/> Bowel movements
		<input checked="" type="checkbox"/> Liver: Bile production begins
		<input checked="" type="checkbox"/> There are taste buds all over the mouth
		<input checked="" type="checkbox"/> Corpus callosum
		<input checked="" type="checkbox"/> Crura cerebri
		<input checked="" type="checkbox"/> Myelination in spinal cord
		<input type="checkbox"/> Crown-heel length 12 cm
		<input type="checkbox"/> Head circumference 10 cm

Unit 13: 3 to 4 Months

13 weeks	—	<input type="checkbox"/> Teeth are growing
		<input checked="" type="checkbox"/> Cilia lining airways
		<input checked="" type="checkbox"/> Most of body sensitive to touch
		<input type="checkbox"/> Crown-heel length 15 cm
14 weeks	—	<input checked="" type="checkbox"/> Girls move their jaws more than the boys do
		<input checked="" type="checkbox"/> Light touch to mouth evokes turn toward stimulus
		<input checked="" type="checkbox"/> 4-lobed cerebral cortex
		<input checked="" type="checkbox"/> Cerebellum resembles adult structure
		<input type="checkbox"/> Crown-heel length 17 cm
		<input type="checkbox"/> Fat deposits in cheeks
15 weeks	—	<input checked="" type="checkbox"/> Stem cells arrive in bone marrow
		<input type="checkbox"/> Body fat emerges throughout the body
		<input checked="" type="checkbox"/> Glucagon in fetal bloodstream

	<ul style="list-style-type: none"> ■ Digestive enzymes Crown-heel length 19.5 cm
16 weeks	<ul style="list-style-type: none"> ■ Quickening Fat deposits upper & lower limbs Tooth enamel ■ Colon lined with villi ■ Bronchial tree nearly complete ■ Canalicular stage begins ■ Hormonal stress response to invasive procedures Crown-heel length 21 cm

Unit 14: 4 to 5 Months

17 weeks	<ul style="list-style-type: none"> ■ Retina has discrete layers
18 weeks	<ul style="list-style-type: none"> Apocrine sweat glands Cream-like substance protects skin Sweat glands ■ Insulin secretion ■ Speaking motion of larynx ■ Corpus callosum complete
19 weeks	<ul style="list-style-type: none"> Melanin production ■ Number of oogonia peak (at about 7 million) within fetal ovaries ■ Daily cycles in biological rhythms ■ Sulci on surface of cerebral hemispheres
20 weeks	<ul style="list-style-type: none"> All skin layers and structures ■ Peyer's patches ■ Surfactant production (low levels) ■ Hearing and responding to sound begins ■ Hearing and responding to sound begins Crown-heel length 28 cm Head circumference 20 cm

Unit 15: 5 to 6 Months

20 weeks - 24 weeks	<ul style="list-style-type: none"> ■ Eyelids separate, eyes open and close
21 weeks	<ul style="list-style-type: none"> Periderm disappears Stratum corneum
21 weeks - 22 weeks	<ul style="list-style-type: none"> If born prematurely from this point on, survival is possible
22 weeks	<ul style="list-style-type: none"> ■ Cornea structure ■ Behavioral states
23 weeks	<ul style="list-style-type: none"> Brain weight 100 grams
24 weeks	<ul style="list-style-type: none"> ■ Blink-startle response; females before males Crown-heel length 34.5 cm

Unit 16: 6 to 7 Months

25 weeks	<ul style="list-style-type: none"> ■ Intestinal lining contains all adult cell types ■ Rods & cones ■ The ability to taste
-----------------	---

26 weeks	<ul style="list-style-type: none"> Additional fat deposits decrease wrinkles Tear production
	<ul style="list-style-type: none"> Terminal sac stage begins The ability to smell has arrived
26 weeks - 38 weeks	<ul style="list-style-type: none"> Brain weight increases 400% to 500%
27 weeks	<ul style="list-style-type: none"> Pupils react to light
28 weeks	<ul style="list-style-type: none"> Distinguishes sounds of different frequencies Crown-heel length 39.5 cm

Unit 17: 7 to 8 Months

30 weeks	<ul style="list-style-type: none"> Breathing motions are common even though there is no air in the womb 6-layered cerebral cortex Head circumference 30 cm
32 weeks	<ul style="list-style-type: none"> Esophagus: Lower esophagus muscles functional Glomeruli formation complete Alveoli Memory - music preferences Crown-heel length 45 cm

Unit 18: 8 to 9 Months

32 weeks - 36 weeks	<ul style="list-style-type: none"> Prenatal food affects newborn taste preferences
34 weeks	<ul style="list-style-type: none"> Rapid weight gain
35 weeks	<ul style="list-style-type: none"> Firm grip Amniotic fluid volume peaks
36 weeks	<ul style="list-style-type: none"> Surfactant production accelerates Brain weight 300 grams Crown-heel length 48.5 cm

Unit 19: 9 Months to Birth

37 weeks	<ul style="list-style-type: none"> Fetus drinks an estimated 15 oz (or 450cc) of amniotic fluid/day
38 weeks	<ul style="list-style-type: none"> Air breathing begins By term, the typical umbilical cord measures 20 to 24 inches (50 to 60 cm) Heart beats 54 million times before birth Major circulatory changes Spinal cord ends at third lumbar vertebrae Brain weight 350 grams Crown-heel length 50 cm Fetus initiates labor Head circumference 35 cm Time to be born!

66 weeks, 5 days	<ul style="list-style-type: none"> Premuscle cells form sheets representing muscles of facial expression
-------------------------	---